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IS 10702 (1992): Rubber hawai chappal [CHD 19: Footwear]

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रबड़ की हवाई चप्पल – विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

RUBBER *HAWAI CHAPPAL* — SPECIFICATION

(*Second Revision*)

UDC 685·314·12 [678·4·06]

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 1992 **Price Group 4**

Footwear Sectional Committee, CHD 019

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Footwear Sectional Committee had been approved by the Chemical Division Council.

This standard was originally published in 1983 and subsequently revised in 1985. In the first revision, hardness for the bottom material was expressed in Shore A durometre hardness along with the test method. The value for the compression set at constant stress was raised, the method of test for change in hardness after ageing at 100 ± 1°C for 24 h and split-tear strength were also incorporated. In the original standard and its subsequent first revision, only the rubber sole with uniform thickness was prescribed. In this, the second revision of the standard, rubber *hawai chappal* with 'tapper-sole design' has also been prescribed with the thickness of the taper-sole varying at toe and heel portions depending on the size of the rubber *hawai chappal*. Accordingly, in this revision, two types of rubber *hawai chappals* have been prescribed depending on the design of the sole, that is rubber sole with uniform thickness and rubber sole with taper-design.

The thickness of the strap wings has been deleted in this revision and is left to the agreement between the purchaser and the supplier. The hardness of the strap rubber has also been reduced.

This standard has been prepared in order to assist the manufacturers to maintain quality of the product. At present, this item is being produced extensively in our country.

The rubber *hawai chappal* which serves as a light duty footwear for general use is very popular in India. This chappal is washable, water-proof and does not required any polish. The rubber strap of the *chappal* is changeable and may be replaced by the users.

The *chappal* should be hygienic and non-injurious and it should protect the health and shape of the foot of the wearer. The design aspect of sole and the composition of the rubber-mix have not been covered in this standard and the scope of the standard has been confined only to the essential physical requirements of rubber *hawai chappal*.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this standard.

Indian Standard

RUBBER *HAWAI CHAPPAL* — SPECIFICATION

(Second Revision)

1 SCOPE

1.1 This standard prescribes requirements and methods of sampling and test for rubber *Hawai Chappal* for general purposes.

2 REFERENCES

The Indian Standards listed below are necessary adjuncts to this standard:

IS No.	*Title*
2050 : 1991	Glossary of footwear terms (*first revision*)
3400 (Part 1) : 1987	Methods of test for vulcanized rubbers : Part 1 Tensile stress-strain properties (*second revision*)
(Part 2) : 1980	Hardness (*first revision*)
(Part 4) : 1987	Accelerated ageing (*second revision*)
(Part 9) : 1978	Relative density and density (*first revision*)
(Part 12) : 1971	Tear strength-crescent test piece
(Part 16) : 1974	Measurement of cut growth of rubber by the use of the ross flexing machine
6368 : 1971	Methods for sampling of rubber and rubber combination footwear
6664 : 1972	Micro-cellular rubber soles and heels

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 2050:1991 shall apply.

4 TYPES

Rubber *Hawai chappals* shall be of two types depending on the design of the sole.

Type 1 — Rubber *Hawai chappal* with uniform sole thickness (*see* Fig. 1)

Type 2 — Rubber *Hawai chappal* with taper-sole design (*see* Fig. 2)

5 REQUIREMENTS

5.1 Material

The material for rubber *Hawai chappal* of both the types shall be compounded from natural or synthetic rubbers or their combinations.

5.1.1 The compound shall be vulcanized and it shall be homogeneous and free from sulphur bloom. The surface shall be free from blisters, cavities, collapses and blemishes. The die markings shall be neat and clean and the surface shall have reasonably good finish.

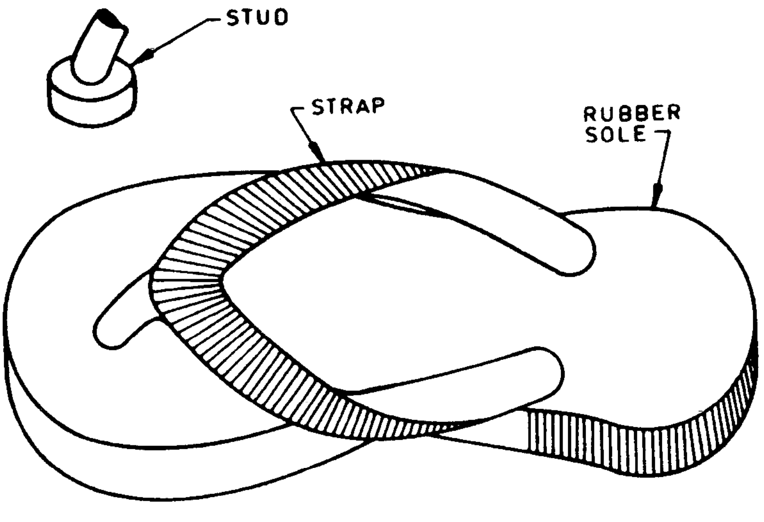


FIG. 1 ILLUSTRATED DIAGRAM OF RUBBER *HAWAI CHAPPAL* WITH STRAP (TYPE 1)

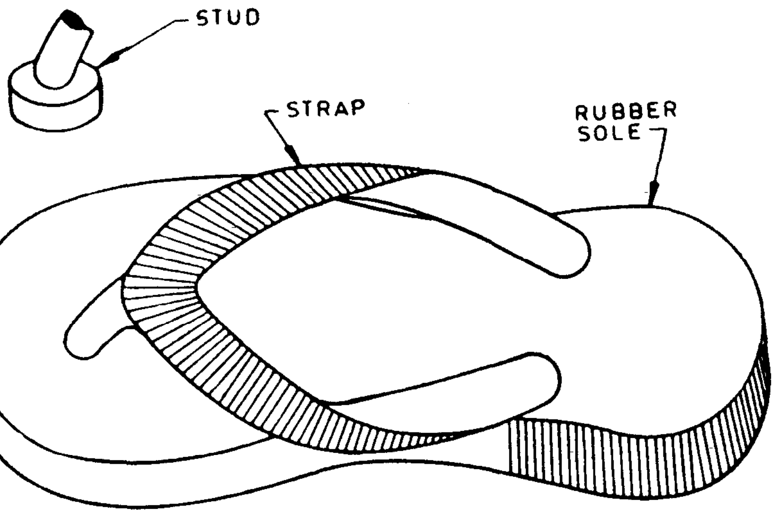


FIG. 2 ILLUSTRATED DIAGRAM OF RUBBER *HAWAI CHAPPAL* WITH STRAP (TYPE 2)

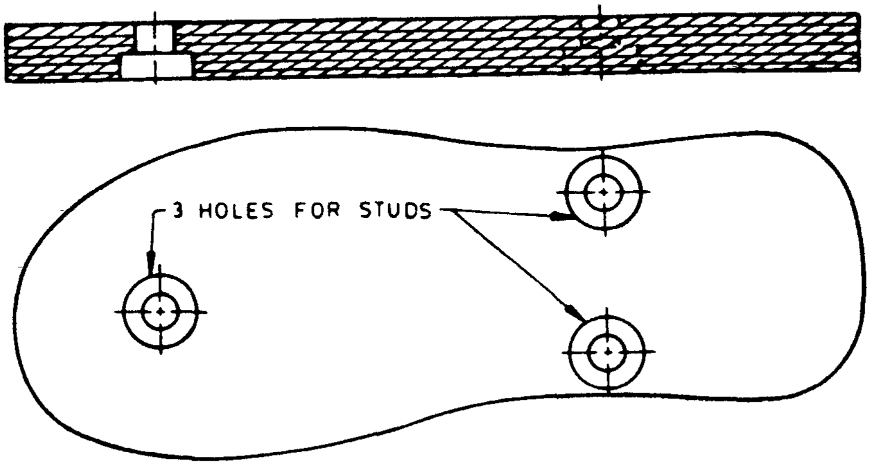


FIG. 3 ILLUSTRATED DIAGRAM OF RUBBER SOLE OF RUBBER *HAWAI CHAPPAL*

5.1.2 The shape, design, colour and surface of the sheets of components shall be as agreed to between the purchaser and the manufacturer. V-strap designs of rubber *hawai chappal* of Type 1 and Type 2 are illustrated in Fig. 1 and Fig. 2 along with the illustrated diagram of the rubber sole given in Fig. 3.

5.2 The minimum length for standard sizes shall be as given in Annex A.

5.3 Thickness

5.3.1 The minimum uniform thickness of sole of Types 1 rubber *hawai chappal* shall be 15.0 mm for all sizes.

5.3.2 The minimum thickness of sole (taper) of Type 2 rubber *hawai chappal* at toe and heel for different size ranges shall be as prescribed in Table 1.

5.3.3 The thickness of the strap wings for sizes 1 to 13 for adults and for sizes 7 to 13 for children for both types of rubber *hawai chappal* shall be as agreed to between the purchaser and the manufacturer.

Table 1 Requirements for Sole Thickness of Type 2 Rubber *Hawai Chappal*
(*Clause* 5.3.2)

Sl No. (1)	Size (2)	Sole Portion (3)	Thickness *Min*, mm (4)
i)	From 3 to 6 for children and from 1 to 6 for adults	a) Toe	12
		b) Heel	15
ii)	7 to 13 (both for children and adult)	a) Toe	15
		b) Heel	18

5.4 The bottom material and the strap for both the types of rubber *hawai chappals* shall also conform to the requirements prescribed in Tables 2 and 3 respectively.

5.5 Hardness of the test pieces after ageing at 100 ± 1°C for 24 hours, shall in no case decrease and shall not increase by 5 Shore A durometer (skin hardness) when tested in accordance with the method prescribed in Annex D.

NOTE — *Test piece* — Wherever possible, for all tests, test pieces shall be cut from the finished article, where this is not possible, the manufacturer shall provide test slabs from same batch/control unit of rubber mix and vulcanized to the same degree and in the same manner as that of the rubber mix from which the straps have been manufactured.

Table 2 Physical Requirements for Bottom Material
(*Clause* 5.4)

Sl No.	Characteristic	Requirement	Method of Test, Ref to	
			Annex	Indian Standard
(1)	(2)	(3)	(4)	(5)
i)	Relative density at 27 ± 2°C	0.4 to 0.5	B	—
ii)	Hardness, Shore A durometer (skin hardness)	45 ± 5	C	—
iii)	Compression set at constant stress, percent, *Max*	25	—	A-1 of 6664:1972
iv)	Split tear strength, kg, *Min*	3.5	E	—
v)	Room temperature shrinkage at 27 ± 2 °C for 2 weeks, percent, *Max*	1.5	F	—
vi)	Shrinkage test at 100 ± 1°C for 1 hour, percent, *Max*	3.0	G	—

Table 3 Physical Requirements for Strap Rubber
(*Clause* 5.4)

Sl No.	Characteristic	Requirement	Method of Test, Ref to	
			Annex	Indian Standard
(1)	(2)	(3)	(4)	(5)
i)	Relative density, at 27 ± 2 °C, *Max*	1.4	—	3400 (Part 9) : 1978
ii)	Tensile, strength, kg/cm^2, *Min*	150	—	3400 (Part 1) : 1987
iii)	Elongation, percent, *Min*	500	—	do
iv)	Breaking strength, kg, *Min* (at toe portion)		H	—
	Size 3 to 13 (for children)	20		
	Size 1 to 13 (for adults)	25		
v)	Hardness (Shore A)	50 ± 5	—	3400 (Part 2) : 1980
vi)	Change in initial hardness after accelerated ageing for 24 hour at 100 ± 1°C	± 5	—	3400 (Part 2) : 1980 and 3400 (Part 4) : 1987
vii)	Tear strength, kg/cm, *Min*	30	—	3400 (Part 12) : 1971
viii)	Stud diameter, mm, *Min*		—	—
	Size 1 to 13	6		
	Size 7 to 13	5		
ix)	Stud bolt, mm, *Min*		—	—
	Diameter	14		
	Thickness	5		

6 MARKING AND PACKING

6.1 Marking

6.1.1 The outer waist of the sole and inner face of the straps of rubber *hawai chappal* shall be marked legibly and indelibly with the following:

a) Size and type;

b) Indication of the source of manufacture;

c) Identification *'for adults'* or *'for children'*, whichever is applicable; and

d) Batch number and date of manufacture.

6.1.2 The rubber straps shall also be marked with the side of foot, that is, right and left.

6.1.3 The rubber *hawai chappals* may also be marked with the Standard Mark of the Bureau.

6.2 Packing

The rubber *hawai chappals* shall be packed as agreed to between the purchaser and the manufacturer. Each package shall contain *chappals* of one size only and shall be marked with the name of the item, size, colour, identification of the source of manufacture and batch number.

7 SAMPLING

7.1 The methods of drawing representative samples of the material and the criteria for conformity shall be as prescribed in IS 6368:1971.

ANNEX A

(*Clause* 5.2)

MINIMUM LENGTH FOR STANDARD SIZES

	Size	*Minimum Standard Length,* mm
Children Range		
	3	126.50
	4	135.00
	5	143.50
	6	152.00
	7	160.50
	8	169.00
	9	177.50
	10	186.00
	11	194.50
	12	203.00
	13	211.00

	Size	*Minimum Standard Length,* mm
Adult Range		
	1	220.00
	2	220.50
	3	237.00
	4	245.50
	5	254.00
	6	262.50
	7	271.00
	8	279.50
	9	288.00
	10	296.50
	11	305.00
	12	313.50
	13	322.00

ANNEX B

[*Table* 2, *Sl No.* (i), *col* 4]

METHOD OF TEST FOR DETERMINATION OF RELATIVE DENSITY

B-1 TEST PIECE

Cut from the samples test piece of 50 mm x 50 mm from vulcanized and post cured sheets/soles.

B-2 PROCEDURE

Condition the test piece at 65 ± 5 percent relative humidity and 27 ± 2°C temperature for at least 24 hours prior to testing. Condition at least three such test pieces.

B-3 CALCULATION

Calculate the relative density as follows:

$$\text{Relative density} = \frac{M}{L \times B \times T}$$

where

M = the mass of the test piece in g after conditioning,

L = length of the test piece in mm after conditioning,

B = breadth of the test piece in mm after conditioning, and

T = average thickness of the test piece in mm at three different places after conditioning.

ANNEX C

[*Table* 2, *Sl No.* (ii), *col* 4]

METHOD OF MEASUREMENT OF HARDNESS USING SHORE A DUROMETER

C-1 TEST PIECE

Cut from the samples test pieces of 50 mm x 50 mm by means of a knife.

C-2 CONDITIONING OF TEST PIECES

Condition the test pieces and Shore A durometer at 65 ± 5 percent relative humidity and 27 ± 2°C temperature for 24 h prior to testing.

C-3 CALIBRATION OF INSTRUMENT

The makers of the instrument provide precalibrated spring force and instructions for the check testing of these instruments. These instructions shall be followed. If any deviation is observed, the instrument should be corrected before use (alternatively, precalibrated vulcanized natural rubber disc of variable hardness may be used for calibration wherever possible).

C-4 NUMBER OF TESTS

Carry out the test on at least 3 test pieces.

C-5 PROCEDURE

Place the test piece firmly on a rigid surface with sole side at the top. Choose a portion of design which is smooth and plain of minimum 36 mm^2 area and the centre is about 12 to 13 mm from the nearest edge. The contact area should nevertheless be as large as possible. Place the indentor normal to the rubber surface and press the instrument evenly without shock on to the rubber with just sufficient force to ensure complete contact of the foot (and bearing plate) with rubber. The pressure should be applied slowly and the maximum pressure applied within 3 to 4 seconds (count 1 to 5). Take the maximum reading immediately after the foot contacts with rubber. Take two such readings of each test piece and average of three test pieces.

C-6 RESULT

Express result directly in Shore A durometer.

ANNEX D

[*Table* 2, *Sl No.* (iii), *col* 4]

METHOD OF DETERMINATION OF CHANGE IN HARDNESS AFTER AGEING AT 100 ± 1°C FOR 24 HOURS

D-1 TEST PIECE

Cut from samples, test pieces of 50 mm x 50 mm, by means of a knife.

D-2 CONDITIONING OF TEST PIECE

Heat the test piece in a suitable ageing oven at 100 ± 1°C for 3 hours. Cool it on a wooden surface for 1 hour; condition the test pieces and the durometer at 27 ± 2°C temperature and 65 ± 5 percent relative humidity for at least 24 hours prior to further testing.

D-3 NUMBER OF TESTS

Carry out test on at least three test pieces.

D-4 PROCEDURE

Measure sole hardness (as R_1) by method outlined in Annex C. Take average of three readings. Keep it in an oven maintained at 100 ± 1°C for 24 hours (keep the samples on an aluminium plate). Remove and cool the test pieces for 1 hour and condition them at 27 ± 1°C temperature and 65 ± 5 percent relative humidity for 24 hours. Check final Shore hardness by the method outlined in Annex C. Take average of three readings (R_2).

D-5 CALCULATION

Increase in hardness due to ageing = $(R_2 - R_1)$

where

R_2 = final reading of Shore A durometer, and
R_1 = initial reading of Shore A durometer.

D-6 RESULT

Express result in Shore A durometer.

ANNEX E

[*Table* 2, *Sl No.* (v), *col* 4]

METHOD OF DETERMINATION OF SPLIT TEAR STRENGTH

E-1 APPARATUS

E-1.1 Tensile Testing Apparatus

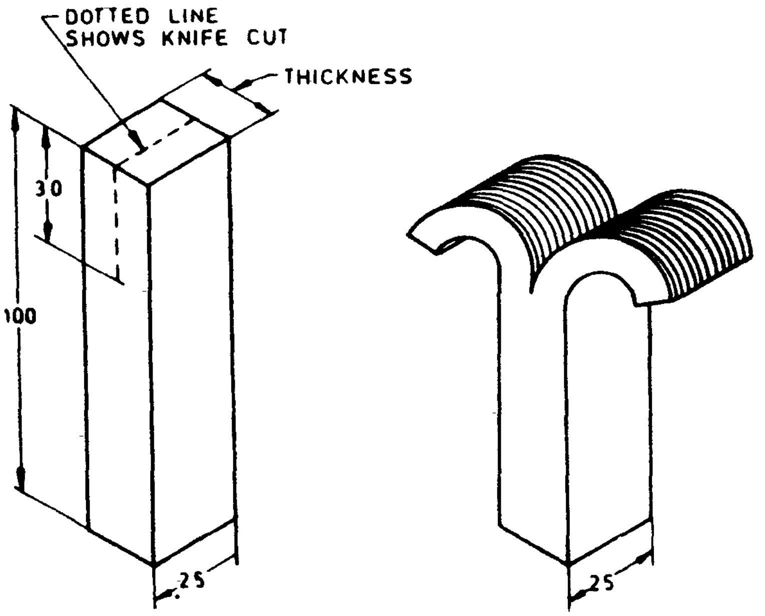
With rate of traverse of 75 mm per minute.

E-2 TEST PIECE

Cut three test pieces of 25 mm x 100 mm along and across the direction of the sheet. Prepare each test piece by splitting it midway between the top and the bottom surface for a distance of 30 mm from one end and thus form two tongues at the end. The test pieces before and after knife cut have been shown in Fig. 4A and 4B.

E-3 PROCEDURE

Clamp the tongue of the test piece in the jaws of the tensile testing apparatus and allow the jaws to separate at a constant rate of 75 mm per minute. Note the maximum load and record the arithmetic average ' three tests in kg as the split tear strength.



4A TEST PIECE BEFORE KNIFE CUT

4B TEST PIECE AFTER KNIFE CUT

All dimensions in millimetres.

FIG. 4 TEST PIECE FOR SPLIT TEAR STRENGTH

ANNEX F

[*Table* 2, *Sl No.* (vi), *col* 4]

METHOD OF TEST FOR DETERMINATION OF ROOM TEMPERATURE SHRINKAGE

F-1 TEST PIECE

Cut from the samples, test pieces of minimum dimensions 125 mm x 5 mm x 15 mm, after splitting all sides of the sample.

F-2 CONDITIONING OF TEST PIECE

Condition the test piece at 65 ± 5 percent relative humidity and 27 ± 2°C temperature for at least 24 hours prior to testing.

F-3 NUMBER OF TESTS

Carry out tests on at least three test pieces.

F-4 PROCEDURE

Condition the test piece. Measure the length of the test piece to the nearest 0.1 mm. Keep the test piece suitably in a closed chamber maintained at 27 ± 2°C for 2 weeks. Remove test piece from the chamber and measure its length again.

F-5 CALCULATION

Calculate the room temperature shrinkage as follows:

$$\text{Room temperature shrinkage, percent} = \frac{L - L_1}{L_0} \times 100$$

where

L_0 = length of test piece in mm before heating, and

L_1 = length of the test piece in mm after heating for 2 weeks.

ANNEX G

[*Table* 2, *Sl No.* (vii), *col* 4]

TEST METHOD FOR DETERMINATION OF SHRINKAGE

G-1 TEST PIECE

Cut test piece of minimum dimension 150 mm × 25 mm × 15 mm from post cured sheet or sole by means of a knife.

G-2 CONDITIONING OF TEST PIECE

Condition the test piece at 27 ± 2°C temperature and 65 ± 5 percent relative humidity for at least 24 hours prior to testing.

G-3 NUMBER OF TESTS

Carry out tests on at least three test pieces.

G-4 PROCEDURE

Trace the test piece on a piece of white paper. Measure the length of the test piece from paper to the nearest 0.1 mm. Keep the test piece suitably in an oven (thermostatically controlled) for 1 hour at 100 ± 1°C. Take out the piece from the oven and cool until the temperature comes down to ambient temperature. Keep the test piece at room temperature for minimum 2 hours. Trace it again on the same paper and measure the length of the test piece on the paper.

G-5 CALCULATION

Calculate the shrinkage as follows:

$$\text{Shrinkage, percent} = \frac{L_0 - L_1}{L_0} \times 100$$

where

L_0 = length of the test piece in mm before heating, and

L_1 = length of the test piece in mm after heating and cooling at room temperature.

ANNEX H

[*Table* 3, *Sl No.* (ix), *col* 4]

METHOD OF DETERMINATION OF BREAKING STRENGTH

H-1 GENERAL

Breaking strength of straps depends on various factors as size, thickness and die design. The smaller size and thickness result in lesser breaking strength. The die design and the angle influence the stress distribution at the angular zone. Again as angle increases, the comfort as well as the stability of the *chappal* on foot palm, during walking, diminishes. Hence a 45° angle measured on the die can be considered as a good compromise.

H-2 TEST PIECE

Trim the flesh very delicately. Cut at 51 mm at both the ends. Check its thickness.

H-3 CONDITIONING OF SAMPLE

Condition the test piece at 65 ± 5 percent relative humidity and 27 ± 2°C temperature for at least 24 hours prior to testing.

H-4 NUMBER OF TESTS

Carry out test on two test pieces of the pair.

H-5 PROCEDURE

After conditioning fix the two ends of the test piece on the grips of a tensile testing apparatus and separate the hands at a speed of 480 mm per minute. Register the strength at break.

H-6 RESULT

Express the reading directly in kilograms.

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Amendments Issued Since Publication

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AMENDMENT NO. 1 SEPTEMBER 1999
TO
IS 10702 : 1992 RUBBER *HAWAI CHAPPAL* — SPECIFICATION

(*Second Revision*)

(*Page* 1, *clause* 5.1.1) — Substitute the following for the existing text:

'**5.1.1** The compound shall be vulcanized and it shall be homogeneous and free from chemical bloom. The surface shall be free from blisters, cavities, collapses, tackiness and blemishes. The die marking shall be neat and clean and the surface shall have reasonable good finish.'

(*Page* 2, *clause* 5.3.2) — Insert the following matter at the end:

'Thickness gradient of toe and heel portion shall be 3 mm.'

[*Page* 3, *Table* 2, *Sl No.* (vi), *col* 3] — Substitute '2.0' *for* '3.0'.

(*Page* 3, *Table* 3) — Delete the characteristics under Sl No. (ii), (iii) and (vii) and renumber the rest accordingly.

(CHD 19)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 AUGUST 2004
TO
IS 10702 : 1992 RUBBER *HAWAI CHAPPAL* — SPECIFICATION

(*Second Revision*)

[*Page* 2, *clause* **5.3.2** (*see also Amendment No.* 1)] — Substitute the following for the existing text:

'**5.3.2** The minimum thickness of sole of Type 2 rubber *hawai chappal* shall be 12 mm.'

(*Page* 2, *Table* 1) — Delete Table 1 and renumber subsequent tables.

[*Page* 3, *Table* 2, *Sl No.* (vi), *col* 3] — Substitute '3.0' *for* '2.0'.

[*Page* 4, *clause* **6.1.1**(c)] — Delete.

[*Page* 4, *clause* **6.1.1**(d)] — Delete.

(CHD 19)

Reprography Unit, BIS, New Delhi, India